

## **REMARKS**

Examiner has entered applicant's amendment of June 14, 2004; and has withdrawn the finality of the office action dated February 11, 2004. The Examiner has also withdrawn the objection and rejection set forth in paragraphs 1-5 of the office action dated February 11, 2004. The Examiner, however, has set forth the following additional rejections.

Examiner has rejected claims 1 and 5-9 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. According to the Examiner, applicant has failed to clearly define the term "mixed-polyether-polyester diol." Specifically, the Examiner has indicated that it is unclear whether the term refers to a physical mixture of a polyether diol and a polyester diol or a single polymeric diol containing both polyether and polyester segments.

Examiner has rejected claims 1 and 5-9 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, it is unclear to the Examiner whether the properties of the composition recited in claim 1 also apply to the pre-chain extended polyurethane (the material not subjected to the post-treatment of claim 8), or to the polyurethaneurea of claims 8 and 9.

Examiner has rejected claims 1 and 5-9 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Specifically, it is unclear to the Examiner whether the properties of the composition recited in claim 1 apply to the

pre-chain extended polyurethane (the material not subjected to the post-treatment of claim 8), or to the polyurethane of claims 8 and 9.

The Examiner has rejected claims 10-29 under 35 U.S.C. § 112, first paragraph, because the specification is not enabling for polyurethanes and processes for producing polyurethanes that have properties outside the ranges recited at lines 2-6 of page 8 of the substitute specification and that can nonetheless be employed to prepare viable polyurethane fibers. Examiner admits that the substitute specification is enabling for polyurethanes that have properties as recited at lines 2-6 of page 8 of the specification; said polyurethanes having the characteristics for preparing viable polyurethane fibers. According to the Examiner, the substitute specification does not enable one skilled in the art to practice the invention as disclosed; and the scope of the claims is not commensurate with the practice of the invention by one of ordinary skill in the art.

Because the applicant has failed to provide enablement for the production of polyurethanes that are outside the range of the properties recited at lines 2-6 of page 8 of the substitute specification, and yet will yield viable polyurethane fibers; the Examiner holds that applicant's claims must be limited to be commensurate in scope with the level of enablement provided. According to the Examiner, unless the skilled artisans were producing polyurethanes having the disclosed properties, they would be unable to practice the invention without undue experimentation.

Examiner has rejected claims 1, 5-9, 12, 14, 16, 22, 24, and 26 under 35 U.S.C. § 102(b) as being anticipated by *Seneker et al.* (U.S. Patent Nos. 5,708,118 or 5,843,357).

These patents disclose spandex-type fibers prepared from an isocyanate terminated prepolymer and an aliphatic amine. A blend of a high molecular weight polyol and a low molecular weight polyol is employed in preparing the isocyanate terminated prepolymer. Examiner cites the abstract and columns 6-10 of the patents to *Seneker et al.* According to the Examiner, the patents also disclose that the prepolymer method promotes uniform distribution of hard segments within the polymer matrix. Said uniform distribution of hard segments provides unusual strength and elongation. Examiner notes column 6, lines 59-62 of the *Seneker et al.* patents. According to the Examiner, the *Seneker et al.* references disclose that the fibers have high elongation and molecular weights that meet those claimed by the applicant. Examiner takes the position that since polymers prepared from the method disclosed in *Seneker et al.* are from reactants equivalent to the reactants disclosed by the applicant, and since the polymers disclosed in *Seneker et al.* have molecular weights that overlap the molecular weights of polymers prepared according to the applicant's invention, then the fibers prepared from the *Seneker et al.* process have the same (or similar) elongation and tenacity values as the fibers prepared according to applicant's process, as by inherency. Examiner holds that applicant has provided no evidence to indicate that the claimed processes of applicant's invention cause the product-by-process to be patentably distinct from the prior art.

Examiner notes that the *Seneker et al.* references disclose production of fibers by the method of reaction spinning; and further, Examiner believes that reaction spinning is considered to be akin to melt spinning. Examiner cites the final three lines of column 6

of the *Seneker et al.* patents. Examiner further notes that the subject matter of claims 1 and 5-9 do not require melt spinning.

It is noted by the Examiner that applicant's responses dated March 3, 2003, and June 30, 2003, make the argument that the polyurethaneurea compositions of the *Seneker et al.* patents do not melt and hence are not melt-spinnable. Examiner claims that this argument is flawed because the issue is not whether the polyurethaneurea is melt spinnable but rather whether the polyurethane (prior to reaction with diamine) is capable of being melt spun and cured by reaction with a diamine to yield a melt spun fiber. Examiner holds that in view of the reactants used by *Seneker et al.* to prepare their polyurethane (pre-diamine extended), the prior art polyurethane of *Seneker et al.* are thermoplastic, and thus capable of being melt spun. The Examiner concludes that since applicant's polyurethane is melt spinnable, and applicant's reactants for preparing said polyurethane are equivalent to those disclosed in *Seneker et al.*, then the polyurethane disclosed in *Seneker et al.* is also melt processable.

To further support this position on the issue of melt-spinning, the Examiner relies on U.S. Patent No. 5,340,902 (*Smith et al.*). Compositions similar to those disclosed in the *Seneker et al.* references are disclosed in the '902 (*Smith et al.*) patent. *Smith et al.* teach that the compositions can be processed by melt spinning or the similar reaction spinning to produce fibers. (See column 8, lines 51-63 in the '902 patent). The *Smith et al.* reference does not constitute part of the rejection, but is relied upon solely to support the Examiner's arguments relating to melt spinning and the teachings of *Seneker et al.*

Examiner further argues that in view of the fact that equivalent reactants are employed in the applicant's invention and in the *Seneker et al.* patents, it is reasonable to assume that applicant's polyurethaneurea is also not melt-spinnable. Examiner does acknowledge that applicant's pre-extended polyurethane is melt-spinnable.

Examiner notes that in applicant's response to office actions dated March 3, 2003, and June 30, 2003, applicant argues that the compositions disclosed in the *Seneker et al.* patents are composed of randomly spaced hard and soft segments. Applicant has stated that his own compositions are composed of uniformly spaced hard and soft segments. According to the Examiner, it follows, therefore, that applicant's compositions possess properties that are different from those disclosed in the *Seneker et al.* compositions.

Examiner holds that the applicant has not addressed the prior art disclosures that state that the prepolymer method of the *Seneker et al* patents promotes uniform distribution of hard segments within the polymer matrix. Such uniform distribution, according to *Seneker et al* allows for unusual strength and elongation properties. Examiner cites column 6, lines 59-62 of the '118 and '357 patents to *Seneker et al.* Examiner disagrees with applicant concerning the randomness in the spacing of the hard segments and the soft segments along any given polymer chain. Examiner holds that the polymers disclosed in the *Seneker et al.* patents contain hard and soft segments that are uniformly spaced.

Finally, Examiner regrets that the present response to applicant's argument regarding the prior art rejection, i.e., U.S. Patent Nos. 5,708,118 and 5,843,357 to

*Seneker et al.*, has not been set forth earlier in the prosecution.

Applicant thanks the Examiner for withdrawing the finality of the office action dated February 11, 2004. Applicant also appreciates the fact that Examiner has withdrawn the objections and rejections as set forth within paragraphs 1-5 of the office action of February 11, 2004.

Applicant believes that he has overcome the Examiner's rejection of claims 1 and 5-9 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Applicant has replaced the alleged indeterminate phrase: "mixed-polyether-polyester diol" with the clear and distinct phrase "hydroxyl terminated polyether/polyester glycols." Both phrases refer to one polymeric compound (in this case, a generic compound) that contains both ester functionality and ether functionality in its backbone. Applicant has also added the phrase "and mixtures thereof," because it is also within the scope of the invention to employ a physical mixture of a polyether diol and a polyester diol, as well as a single polymeric diol containing both polyether and polyester segments. The above-described amendment has been added to Claim 1. Support for the amendment can be found in paragraph [0022] of the substitute specification submitted with applicant's response to office action filed June 4, 2004 [hereinafter "substitute specification"].

Applicant further believes that he has overcome the Examiner's rejection of claims 1 and 5-9 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as

to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The properties of the composition recited in claim 1 -- a (number average) molecular weight of about 200,000 and above, a tenacity of about 0.6 gm/denier and above, and an elongation of about 400% and above -- refer to the polyurethane polymer that contains no urea functionality. All of these properties relate to a polyurethane polymer prior to post-treatment of said polyurethane with a diamine monomer. Fibers prepared from such a polyurethane polymer have a substantial lack of urea functionality in the polyurethane molecules. Support for this statement is found in paragraph [0013] of the substitute specification. The crux of the present invention is that fibers prepared from polyurethanes obtained from the presently disclosed inventive methods (the three-step process and the two-step process) can have physical properties (see above) that rival spandex fibers; all spandex fibers being spun from polymers that contain a substantial amount of urea functionality.

In order to overcome Examiner's rejection of claims 1 and 5-9 under 35 U.S.C. § 112, second paragraph, applicant has cancelled claims 8 and 9. Post-treatment of the polyurethane polymer is neither a necessary nor sufficient condition for one skilled in the art to practice the present invention.

Applicant has overcome Examiner's rejection of claims 1 and 5-9 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The rejection has been overcome by the cancellation of claims 8 and 9 which refer to poly (urea) urethanes. As disclosed in the specification,

can be found in paragraph [0013] of the substitute specification, where it is disclosed that “the molecular polarity of the polyurethane fiber of present disclosure is weaker than the polarity of the Lycra® spandex molecules because of a substantial lack of urea functionality in the polyurethane molecules.” Again, post-treatment of the polyurethane molecules of the present invention with an organic diamine compound is an optional treatment for improving the physical characteristics of the ultimate fibers.

Applicant believes that he has overcome Examiner’s rejection of claims 10-29 under 35 U.S.C. § 112, first paragraph, because of non-enablement for polyurethanes having properties outside the ranges recited at lines 2-6 of page 8 of the substitute specification. The properties are as follows: a polyurethane polymer having a (number average) molecular weight of about 100,000 and above, and preferably about 200,000 and above; a tenacity of about 0.6 grams/denier and above; and an elongation of about 400% and above. All of these properties are present in the fibers prepared from said polyurethane polymer. (See paragraph [0020] of the substitute specification). Examiner’s rejection has been overcome by cancellation of claims 13, 14, 15, 16, 23, 24, 25 and 26, in the present amendment. All of these claims relate to a polyurethane that has been post-treated with diamine compound. As previously stated, post-treatment is simply an optional additional step in the present process.

In addition, applicant has attempted to overcome the Examiner’s rejection of claims 10-29 under 35 U.S.C. § 112, first paragraph, by amending the independent claims 10 and 20 to include the limitation of preparing a polyurethane polymer fiber precursor



wherein said precursor (i.e., the polyurethane polymer per se) has the properties disclosed at lines 2-6 of page 8 of the substitute specification. Support for these amendments can be found in paragraph [0020] of the substitute specification.

Applicant submits that the Examiner is incorrect in his rejection of claims 1, 5-9, 12, 14, 16, 22, 24, and 26 under 35 U.S.C. § 102 (b) as being anticipated by *Seneker et al.* (U.S. Patent Nos. 5,708,118 and 5,843,357<sup>1</sup>). The abstract of the *Seneker et al.* patents teaches away from the present invention in that it discloses the use of a “polyol blend comprising a low molecular weight diol having a molecular weight below 750 Daltons with a high molecular weight glycol which may be a 1500 Dalton to 20,000 Dalton molecular weight, ultra-low unsaturation polyoxypropylene glycol with an unsaturation of less than about 0.010 milliequivalents per gram.” Applicant’s invention does not allow such a blend to be employed. (*See* claim 1 of the present application).

In a further distinction, diamine chain extension is a critical step in the *Seneker et al.* patents whereas it is merely an optional step in the present invention. The dramatic increase in physical properties so happily reported in the *Seneker* patents (*See* page 6, column 30) always relates to a polymer containing urea functionality, and is the direct result of the use of a specific type of chemical: an ultra-low unsaturation polyoxypropylene glycol. The improvement in the physical properties of the poly(urea)urethane of the *Seneker et al.* patents has nothing to do with a change in the process of preparing spandex fibers. Applicant changes the prior art process by segregating low molecular weight glycols from high molecular weight glycols, and by

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<sup>1</sup> The ‘357 patent is a divisional of the ‘118 patent, which implies that the specifications are the same.

incorporating additional steps.

Although the *Seneker et al.* patents do not practice a one-shot process or a quasi-prepolymer process (See column 6, line 55), they nonetheless do not segregate the polyol components when employing their prepolymer process. Additionally, *Seneker et al* always employs a diamine, a step that is not critical in applicant's invention.

Applicant further notes that although the products of the *Seneker et al* patents do indeed have a uniform distribution of hard segments within the polymer matrix, these results are obtained by the chain extension of an isocyanate-terminated prepolymer in an aprotic solvent. See column 6, line 55. Applicant achieves uniform distribution of hard segments and soft segments by employing a unique three-step process, wherein high molecular weight diols and low molecular weight diols are always reacted separately during preparation of the polyurethane polymer. Furthermore, *Seneker et al.* involves preparation of a poly(urea)urethane polymer having a substantial amount of urea functionality in the backbone. This is simply not the case with the present invention. Applicant disagrees with the Examiner's statement that "the fibers are produced from equivalent reactants." In fact, when Examiner holds that "applicant's claimed elongation and tenacity values are inherent properties of the disclosed [sic] fibers," that is exactly what the present invention is all about. Applicant in this novel process, seeks to duplicate spandex fibers without using all of the prior art ingredients, i.e., without the use of any organic diamines. In applicant's invention, the use of diamines is an optional post-treatment step, and not for building molecular weight of the polymer.

Applicant further disagrees with the Examiner's assertion that no evidence has been provided by applicant to support the product-by-process of applicant's invention to be patentably distinct from the *Seneker et al.* prior art. Applicant submits that his product-by-process contains on the molecular level, a well-ordered array of hard segments (carbamate functionality) and soft segments (alkyleneoxy functionality) in the polymer backbone; and that such a non-random arrangement of functionalities in a polyurethane polymer is not known in the prior art. Applicant agrees that a non-random arrangement of hard segments and soft segments can be found in the prior art when the subject polymer is a poly(urea)urethane. *cf.*, *Seneker et al.*

Applicant disagrees with the Examiner's assessment of the similarity between melt spinning and reaction spinning. Examiner believes that reaction spinning is akin to melt spinning. The melt spinning process employed in applicant's invention is practiced without use of a solvent. (*See* claim 11 of the present application). Applicant's polyurethane polymer fiber precursor is simply pelletized, melted, and spun into fibers. Reaction spinning as disclosed in the *Seneker et al* patents comprises the steps of spinning an isocyanate terminated prepolymer into strands, and then passing the strands into a bath of water or organic solvent, e.g., toluene, containing a diamine chain extender. (*See* column 7, line 2).

Applicant agrees with the Examiner's assertion that the subject matter of claims 1 and 5-9 do not require melt spinning. Applicant asserts that melt spinning is the preferred process for employing the disclosed composition of claim 1, but is not mandatory.

Applicant also agrees with the Examiner's assertion that the isocyanate terminated prepolymer (the pre-chain extended polymer) of the *Seneker et al.* patents is spinnable. (See *Seneker et al.* at column 7, line 16). However, the *Seneker et al.* prepolymer (prior to chain extension with organic diamine) is prepared from a blend of high molecular weight polyols and low molecular weight diols. (See column 7, line 58).

Applicant accepts the Examiner's arguments concerning the *Smith et al.* patent (U.S. Patent No. 5,340,902) and relating to the issue of melt-spinnability (column 8, line 51). However, applicant believes that the *Smith et al.* reference discloses spinning processes as relating ultimately to the preparation of poly(urea)urethanes, wherein there is a substantial amount of urea functionality in the backbone of the polymer. Any urea functionality in the polyurethane polymer prepared by applicant's method is optional; and even when urea functionality is present, it is not substantial, as the molecular weight of the polyurethane polymer prepared according to the process of claim 10 or claim 20 has already been built.

Applicant further asserts that although the *Seneker et al.* patents do disclose non-random spacing of hard and soft segments in the final poly(urea)urethane polymer, the patents do not disclose non-random spacing of hard and soft segments in the polyurethane precursor polymers. In fact, applicant believes that such non-random spacing is impossible to achieve in a polyurethane except by his method of segregating diols. In a personal interview with the Examiner on January 25, 2005, agreement with respect to the claims pending in the present case was not reached. However, Examiner

has clarified his position regarding the allowability of the claims.

Specifically, the Examiner has requested that the following two issues be addressed and made of record by the applicant. The first issue relates to the fact that the phrases “polyether/polyester glycol” and “mixed polyether/polyester diol” both refer to a single generic compound that contains both ester functionality and ether functionality in its backbone. The second issue relates to the fact that the disclosed properties relating to molecular weight, tenacity and percent elongation relate to the polyurethane polymer prior to post-treatment with an organic diamine.

Examiner agreed that the process claims, i.e., claims 10 and 20 of the present application, are patentable. However, in the Examiner’s opinion, the product-by-process claims read on the ‘118 and ‘357 *Seneker et al.* patents because applicant’s pending product-by-process claims 12 and 22 do not exclude the use of organic diamines. In the absence of such exclusion, applicant’s product-by-process could be a poly(urea)urethane having properties similar to the poly(urea)urethane disclosed in the *Seneker et al.* patents.

In view of the Examiner’s position on this issue, applicant has, with traverse, amended the composition and product-by-process claims to include “closed” language. Applicant has submitted new independent claims 30 and 31. Support for claim 30 can be found in the substitute specification at sections [0022] to [0026]. Support for claim 31 can be found in the substitute specification at sections [0044] and [0046].

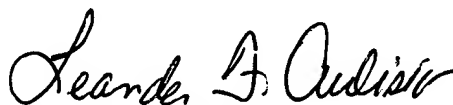
It is possible that the source of confusion regarding the present invention stems from the fact that applicant has employed an analogy between spandex elastomers and

polyurethane elastomers. To clarify, applicant is not claiming a process for preparing spandex elastomers; rather, applicant's invention is concerned with a novel process for preparing polyurethane polymers, and the polymers prepared by such a method. Even the composition claim (claim 1) of the present application contains a limitation as to process – “wherein said first and second diol monomers are always reacted separately during preparation of the polyurethane polymer.” Examiner has failed to cite any references relating to urethane polymer chemistry. All of the Examiner's arguments relating to melt-spinnability and non-randomness of “hard” segments are wrapped in the cloak of spandex polymer chemistry.

Applicant believes that the present amendments to the claims will serve to focus the Examiner's attention on the fact that applicant discloses and claims a process for preparing polyurethane polymers that are precursors for the production of fibers. These fibers are not spandex fibers.

Applicant believes that the preceding remarks and amendments to the claims will put the present application in condition for allowance. In view of the foregoing, applicant hereby respectfully requests that the Examiner allow the present application.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "Leander F. Aulisio". The signature is fluid and cursive, with the first and last names being more prominent.

Leander F. Aulisio  
Reg. No. 31,732

Date: February 15, 2005